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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,042	02/27/2004	Kie Y. Ahn	1303.050US2	8328

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EXAMINER	
LANDAU, MATTHEW C	

ART UNIT	PAPER NUMBER
2815	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/789,042	AHN ET AL.	
	Examiner	Art Unit	
	Matthew C. Landau	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 April 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-45* is/are pending in the application.

4a) Of the above claim(s) *20-45* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/15/07*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Claims 20-45 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on January 3, 2006.

Allowable Subject Matter

The indicated allowability of claims 2 and 13 is withdrawn in view of a new interpretation of Kaushik et al. Rejections based on the newly cited reference(s) follow.

Information Disclosure Statement

The information disclosure statement filed December 15, 2007 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. Copies of the three lined through citations could not be found in the file or in the file of the parent application.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it

pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 7-11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The limitation "including $LaAlO_3$, Al_2O_3, and La_2AlO_3" is not supported by the originally filed application. The specification describes an embodiment wherein the dielectric layer comprises $LaAlO_3$, Al_2O_3, and La_2O_3, but does not describe a layer containing La_2AlO_3. For the purposes of the below art rejections, it is assumed this was merely a typo and Applicant intended to claim La_2O_3, not La_2AlO_3.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3, 7-14, 18, and 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Kaushik et al. (US Pat. 6,541,280, hereinafter Kaushik).

Regarding claims 1, 2, 7, 12, and 13 Figure 2 of Kaushik discloses a substrate 20; a film 22/24 disposed above the substrate, the film consisting essentially of (or including): $LaAlO_3$

arranged as a layered structure of one or more monolayers (layer 24); Al_2O_3 arranged as a layered structure of one or more monolayers (layer 22); and La_2O_3 arranged as a layered structure of one or more monolayers. Kaushik discloses that the layer of $LaAlO_3$ is actually two metal oxide layers (aluminum oxide and lanthanum oxide) (col. 3, lines 35-42). Therefore, a layer of $LaAlO_3$ inherently includes a layer of La_2O_3. Regarding claims 7 and 12, Kaushik disclose the dielectric layer 14/22 is a gate dielectric, and the overlying conductive layer 16/26 is a gate electrode (col. 2, lines 62-65). Therefore, the device inherently has a body region (channel region) between a source region and a drain region. Further regarding claim 7, Kaushik discloses the film is formed by atomic layer deposition (ALD) including: pulsing a lanthanum containing precursor into a reaction chamber containing a substrate; pulsing a first oxygen containing precursor into the reaction chamber; pulsing an aluminum containing precursor into a reaction chamber; and pulsing a second oxygen containing precursor into the reaction chamber (col. 3, lines 15-41). Note that although Kaushik disclose the claimed ALD process, the limitations are in fact merely product-by-process limitations.

Regarding claims 3 and 14, Kaushik discloses the film 24 is substantially amorphous (col. 3, lines 15-17, and col. 4, lines 40-42).

Regarding claim 8, the limitation beginning "wherein pulsing a lanthanum containing precursor into a reaction chamber…" is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966.

Regarding claim 9, the limitation beginning "wherein pulsing an aluminum containing precursor into the reaction chamber..." is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art.

Regarding claim 10, the limitation beginning "wherein pulsing an aluminum containing precursor..." is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art.

Regarding claims 11, 18, and 19, Figure 5 of Kaushik discloses a floating gate 46 situated between the body and the gate 50; a floating gate dielectric 48 disposed on the floating gate, separating the floating gate and the gate, the floating gate dielectric containing the $LaAlO_3$ arranged as a layered structure of one or more monolayers. Note that in Fig. 5, the dielectric layer is a graded layer that is graded from pure Al_2O_3 at the bottom, to $LaAlO_3$ in the middle (col. 5, lines 65-67). Therefore, the dielectric layer contains at least one monolayer of Al_2O_3 and at least one monolayer of $LaAlO_3$ (which inherently includes at least one monolayer of La_2O_3 as explained above).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4-6 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaushik.

Regarding claims 4 and 15, Kaushik discloses the $LaAlO_3$ layer has a dielectric constant from 10 to 25 (col. 3, lines 60-65). In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). Further, the claim(s) is(are) prima facie obvious without showing that the claimed range(s) achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claims 5 and 16, Kaushik does not explicitly disclose the film exhibits an equivalent oxide thickness from about 1.5 angstroms to about 5 angstroms. However, the claim(s) is(are) prima facie obvious without showing that the claimed range(s) achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of

optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Regarding claims 6 and 17, Kaushik does not explicitly disclose the film exhibits an equivalent oxide thickness of less than 3 angstroms. However, the claim(s) is(are) prima facie obvious without showing that the claimed range(s) achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996) (claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Response to Arguments

Applicant's arguments filed December 3, 2007 have been fully considered but they are not persuasive.

Applicant argues that "Applicant cannot find in Kaushik a disclosure, a teaching, or a suggestion of a electronic device including a film having La_2O_3, $LaAlO_3$, and Al_2O_3 as recited in amended independent claims 1, 7, or 12". However, as explained in the new rejection presented above, Kaushik does teach each limitation of the claim.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is 571-272-1731. The examiner can normally be reached on 9:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matthew C. Landau/
Primary Examiner, Art Unit 2815